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# Bridging Intellectual Capital, Sustainable Development and Quality of Life in Higher Education Institutions

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**Abstract:** This paper analyses the relationship between the intellectual capital of higher education institutions (HEIs) and their sustainable development practices, and assesses whether higher education institutions' sustainable development practices are related to their stakeholders' quality of life. Using a structural equation model, two model specifications are estimated, gathering primary data from a convenience sample composed of 738 full-time students and 587 teachers/researchers at seven Portuguese higher education institutions. The findings reveal that intellectual capital influences sustainable development practices directly and positively, whereas sustainable development practices influence students' quality of life in a significant way, although the same is not verified for teachers/researchers. These findings provide insightful implications for policy-making and intellectual capital management for practices in higher education institutions; firstly, by showing that the sustainable development concept is associated with HEIs' practices of economic, environmental, social and organisational sustainability; secondly, by concluding that public Portuguese HEIs need to improve the social dimension of their sustainable development practices, and here there may be room for improvement in the institution through better and more proficient social engagement that is more directed to the challenges of sustainability and social change; and thirdly, by showing that the inclusion of better sustainable practices has repercussions on the quality of life of all stakeholders.

**Keywords:** higher education institutions; intellectual capital; performance; quality of life; sustainable development

## 1. Introduction

The different ways in which organisations, cities, regions and countries manage and introduce intellectual capital (IC) practices have been found to be a decisive factor, not only for their reputation, competitiveness and wealth, but also in raising their sustainability, focusing on citizens' quality of life (QoL) and contributing to a more sustainable and balanced society [1]. Despite the remaining gap and lack of information in the literature about how intellectual capital and sustainability influence each other from the practitioners' perspective, researchers' theoretical perspectives have shown how IC and sustainability are closely related [2]. For example, it was revealed that a country's knowledge assets and intangible assets have significant implications for its future value, inasmuch as they represent a source of skills and competences considered essential for national economic growth, the development of human capital and promotion of QoL [3]. Adding to the previous statements, knowledge, creativity and innovation have become the main factors stimulating social and economic development, reinforcing the role of IC in generating sustainable growth and development [4].

IC plays an important role in determining regional competitiveness, being even more important in regard to sustainable regional competitiveness, and it is assumed that the most important intellectual resources are those that contribute to the creation of a competitive advantage and so result in an improved economic situation of a region [5]. For example, Dal Mas [6] demonstrated the relationship between IC and sustainability from a practitioner's point of view, supporting the interlink between IC and sustainable regional competitiveness. In addition, it increases society's awareness of sustainability, defines a region's legal and institutional environment, expresses relationships between the various stakeholders and, as a whole, creates the basis for forming sustainable competitive advantage. According to Malhotra [7], the intangible assets of a country have significant implications for the future national value, because they represent a source of the skills and competences considered essential to national economic growth, human development and QoL.

Higher education institutions (HEIs) are also part of this premise, as they are experiencing the challenges of sustainability, which is increasingly recognised as an essential driver for the development of sustainable societies [8], and also contributing to the QoL of their stakeholders and the populations where they are located [9]. Several challenges have been faced by HEIs, namely regarding budget reductions, which imply the implementation of efficiency and cost reduction logics, as well as adopting new community welfare promotion practices to improve their own quality of academic life (QAL). In this way, HEIs reinforce the attractiveness and retention of human and financial resources, which will positively contribute to the sustainability of these institutions. HEIs have shown a growing commitment to sustainable development (SD) through their mission statements, support and agreements, as well as through the effective implementation of the initiatives and practices of SD [10]. In recent years, some studies have been carried out regarding HEIs' involvement in the implementation of SD practices, e.g., [10–12]. These practices are linked to different dimensions (e.g., economic, environmental, social and organisational) and are integrated into the main activities of HEIs, namely teaching, research, operations, social commitments and culture [10].

Bearing in mind the publication by UNESCO [13] for education institutions, including HEIs, it is recommended that all their processes should be based on sustainability principles. In specific terms, for SD practices in HEIs to be more effective, according to UNESCO, the institution as a whole has to be transformed. Such a whole-institution approach aims at mainstreaming sustainability into all aspects of the education institution, which involves rethinking the curriculum, campus operations, organizational activities, culture, student participation, leadership and management, community relationships and research [14].

In the literature, the concepts of sustainability and SD are commonly considered interchangeable, and sometimes as equivalent, e.g., [15,16]. This study, in the same line as stated in [17], assumes that sustainability is a principle, while SD relates to a social process involving choices and decisions towards sustainability. In other words, SD is the means to achieve sustainability, which is the final, long-term objective [16]. Therefore, HEIs have a fundamental role to perform in implementing and leading SD initiatives through the institutions' internal policies and practices.

Following this line of research, having as a vision the whole-institution approach mentioned above, the objective of this study is to fill this research gap in the perceptions of the stakeholders of Portuguese HEIs in relation to their SD practices, and, in turn, investigate how these practices can contribute to these stakeholders' QoL. Regarding HEIs' IC, there is still room and a need to understand how the management of IC can be articulated according to the existing SD practices in these institutions, so that the latter can function as mechanisms to identify existing gaps in HEIs' strategic reports and plans to be filled in the short and long-term.

Considering the above and the stakeholders' perspective, this study aims to fulfil the following objectives: (i) ascertain whether there is a direct, positive and significant relationship between HEIs' IC and their SD practices; and (ii) check whether HEIs' SD practices are directly, positively and significantly related to their stakeholders' QoL, thereby shedding light on a new perspective of the ongoing research on IC.

Considering the importance of IC, and having found no studies so far relating HEIs' IC with their own SD practices and QoL, considering stakeholders' perception, this study proposes to analyse SD practices, through economic, social, environmental and organizational dimensions, and the QoL of HEIs' stakeholders (students, teachers/researchers) through: (i) students' quality of academic life (QAL); and (ii) through the quality of work life (QWL) of teachers/researchers. This approach is of interest to both the scientific community and to HEI managers, as it is an innovative and relevant subject, never before studied, and may lead to better results for students and greater motivation among their collaborators.

To fulfil these aims, there is, first, a brief overview of the evolution of the literature; firstly, on IC in HEIs and the relationship with SD practices, and secondly on the relationship between SD practices in HEIs and QoL. Then, two models are presented and tested through quantitative analysis, gathering primary data from students and teachers/researchers at seven Portuguese HEIs, using a structural equation model (SEM) and the partial least-squares (PLS) method in order to verify the robustness of those relationships. Finally, the conclusions, implications and limitations of the study are elaborated.

## 2. Intellectual Capital of HEIs and Sustainable Development Practices

As entities involved in the creation and spread of knowledge, HEIs have been taking on a more entrepreneurial role, involving networking and international collaboration, and are increasingly more articulated in regard to critical issues of sustainability and social change, as stated by [18]. These authors highlight the fact of this idea being in line with the perspective of the fourth stage of IC, i.e., the creation of knowledge focused on the ecosystem. Studies related to this stage defend a change in approach to understanding the drivers of wealth creation, based on a balance of intellectual and financial measures, in order to create a more holistic vision of the national innovation capacity and the renewal of society and politics [19].

Therefore, monitoring IC is a way of measuring and controlling intangible and fundamental elements for these organisations [7], at the same time as ensuring SD. Similarly, the management of IC and its importance in HEIs are examples of issues studied by various authors, e.g., [20], as well as the association between HEIs' IC and sustainability [7], and how SD can be integrated into HEIs' practices [21].

Many HEIs have begun to incorporate SD practices into their systems and a variety of sustainability assessment tools have been developed to support HEIs in systematically measuring, auditing, benchmarking, and communicating SD efforts to their stakeholders [22]. As an example, it may refer to the Association for the Advancement of Sustainability in Higher Education (AASHE), which began in 2006. AASHE empowers higher education faculties, administrators, staff and students to be effective change agents and drivers of sustainability innovation [23]. This association developed the Sustainability Tracking, Assessment and Rating System (STARS), which is a framework for colleges and universities for measuring their own sustainability and it is the product of an extensive stakeholder engagement process. This approach fits also with the key elements for whole-institution approaches mentioned by UNESCO [13], as it allows the HEI, together with its stakeholders (e.g., teachers/researchers and students), to jointly develop the vision and strategic plan to implement SD practices in the whole institution.

However, despite the role played by HEIs in promoting SD being recognised as essential, e.g., [24,25], with examples of SD practices in different dimensions (e.g., environmental, economic, social and organisational) worldwide and integrated in HEIs' main activities (e.g., education, research, operations, social involvement and governance/culture) [26], some articles, e.g., [10,21,27] have pointed out that SD practices vary considerably from one HEI to another, and as for results found for SD practices implemented in Portuguese HEIs specifically, this is still at an early stage.

The potential impacts on HEIs' SD are based on practices related to economic growth, changes in social and business practices, social cohesion, contributions to climate change, sustainable human behaviours and urban development [22]. The most explored dimensions related to SD, in the HEI

context, are environmental, social/cultural, economic and organisational/educational/political. These dimensions are integrated into activities related to teaching, research, campus operations, community actions, assessment and the drawing up of reports [10]. Some authors identify three fundamental dimensions of SD: economic, social, and environmental [11,28]. However, it is increasingly common to find other dimensions, such as organisational, e.g., [29,30] and cultural, e.g., [29,30]. In the specific case of HEIs, the following dimensions were proposed in regard to the implementation of SD practices: environmental, economic, social/cultural, and organisational/educational/political, e.g., [10,24,31]. This study considers that SD practices operate in the following four dimensions: economic, social, environmental, and organisational.

In the same vein of [10], the economic dimension of SD involves practices of economic viability and considers economic needs (e.g., concern about economic performance, plans and actions to improve energy efficiency, and budgeting for practices that promote sustainable development). The social/cultural dimension concerns the actions of an organisation's human resources or the surrounding community (e.g., policies to promote equality and diversity, developing and participating in recreational, cultural or sporting activities, concerns and initiatives regarding social inclusion and scientific initiatives directed towards the outside community). The environmental dimension proposes including environmental concerns and practices in the institution's strategy (e.g., constructing sustainable buildings on campus, separating waste and sending it for recycling and equipment to generate renewable energy). Finally, the organisational dimension concerns how institutions mould their behaviour and values, and how the different stakeholders perceive and if they are satisfied with approaches and objectives related to sustainable development (e.g., declarations and statements on the HEI's views and formal documents on values, strategy, transparency in governance and ethical commitments).

Some authors highlight the importance of stakeholders' perceptions in research related to HEIs' SD, e.g., [12,32]. The discussion on sustainability is based on stakeholder theory [17]. Stakeholder theory aims to analyse the relationship between an organization and the economic and social actors (individually or collectively) that affect, are affected by, and have interests in the procedural and substantive aspects of corporate activities. The management principles of stakeholder theory are reflected in the new model of HEIs' governance through the presence of different internal and external stakeholders in the various management organs [33]. In addition, the stakeholder satisfaction affects organisations' competitiveness and image, with stakeholders' needs and expectations affecting the organisation's management system [34]. The same author concluded that a wide understanding and incorporation of these needs in the management system can contribute to achieving the objectives proposed and increasing stakeholders' QoL.

HEIs' IC can be one of the key elements in promoting SD [7], and in its generalized expression, the SD concept represents an evolutionary coordination of various concerns linked to well-being, such as social, cultural, economic and environmental concerns [35]. Furthermore, these authors emphasize that sustainable behaviour is conceived as actions that contribute to the QoL of current and future generations. HEIs' IC is identified in various studies as a composite of human capital, structural capital and relational capital, e.g., [36,37]. This capital approach differentiates from the one presented in the scope of the theory of capital developed by Pierre Bourdieu, since the latter considers other types of capital, such as economic capital, cultural capital, social capital and symbolic capital [38]. In this scope, it deserves to be outlined that, in the case of social capital, Bourdieu [38] refers to networks as a form of social capital, but also incorporates the nature of culture and how it is reproduced and transformed, as well as how it connects to social stratification and the reproduction and exercise of power, which is connected with the mode of how human capital evolves in the scope of social systems, as a heritage and a reproductive mechanism of social stratification. In this study, HEIs' IC stems from the triad of capitals; human, structural, and relational, having as reference the studies of [36,37].

In the HEI context, human capital is the sum of explicit and tacit knowledge held by all the human resources existing in the institution (teaching, research and development, management, directing

and administrative staff in all services), acquired through both formal and non-formal education and the training processes included in their activities [20,39,40]. According to the vision expressed in [41], human capital can play an important role in SD practices, through the intermediation between the various stakeholders and regional actors, through the demonstration of good practices such as developing management activities, strategic planning, construction projects, minimizing waste and practices of energy efficiency and sustainability, and responsible purchasing programmes, and through good, environmentally-friendly initiatives with an impact on the campus. Leaders can offer incentives to recognise and reward staff for becoming involved in groups leading SD in the academic and regional community. Notably, [10] concluded that, in general, Portuguese HEIs value and stimulate professional and personal development (e.g., vocational training, academic training), in order to ensure the adoption of good practices within the institution.

Additionally, in the HEI context, structural capital includes all explicit knowledge interrelated with the internal processes of the promotion, communication, and management of scientific and technical knowledge in the organisation, which spans both organisational aspects (operating environments derived from the interactions between research management and the organisation of processes, organisational routines, corporate culture and values, and internal procedures, within the scope of quality and information systems, among others), and technological aspects (technological resources available in the university, such as bibliographic and documentary resources, archives, technical developments, patents, licenses, software, and databases, among others) [39,42]. For example, in [43], the structural capital was related to the SD practices towards the improvement of some organisational processes and practices, such as structural improvements based on new technologies (databases, intellectual property) and organizational culture based on the management of environmental sustainability practices. However, in [10], it was stressed that, until now, in Portuguese HEIs the focus has been on processes related to the separation of waste and its forwarding for recycling and plans to reduce the production of waste (e.g., paper, plastic, metal, oils, batteries), so as to ensure SD.

Concerning relational capital in the HEI context, this reflects the extensive collection of economic, political and institutional relationships that have been built up and maintained between HEIs and their non-academic partners (companies, non-governmental organisations, local government and society in general), as well as the perceptions others hold of the institution in terms of its image, attractiveness, trustworthiness and security, among others [40,42].

Relational capital is the connector between the HEI and its various stakeholders, partners, firms, institutions, etc. In [44], the importance of relational capital for SD was revealed, in that it stimulates people's participative and cooperative capacity and makes them responsible for community development, through promotion and interaction between people, structures and institutions, sustained by mutual trust, tolerance and cooperation, as well as mutual respect, civility and participation. Initiatives related to SD in education, research, operations and the outside community help HEIs to respond to various challenges, attracting resources, lowering costs, promoting more effective management and tackling new challenges in society [45]. All this will also contribute to a more positive image of the HEI, attracting more students, promoting quality and excellence, and thereby contributing to the HEI's internationalization.

Considering the above, the following research hypothesis is formulated:

**Hypothesis 1 (H1).** *HEIs' IC has a positive and significant influence on the institution's sustainable development practices.*

## 3. Sustainable Development Practices and Quality of Life

The idea that economic development must be sustainable implies recognising the basic idea that natural resources are scarce and limited, therefore accepting that different socio-economic activities must be restrained [46]. However, according to the same authors, the concept extends ideologically to

the cultural and social relations involved in SD processes, including those affecting social well-being and QoL.

The concept of sustainability emphasizes the idea of human behaviours that allow individuals in the present and future to satisfy their needs without exceeding nature's capacity to recover the resources extracted from it [47,48]. These human behaviours involve psychological tendencies and behaviours that show concern about conditions in the physical environment and the completeness of the social environment [46].

In turn, QoL covers a number of indicators portraying various environmental, social, economic and subjective factors [49]. Therefore, a better QoL can be achieved in societies that enjoy a well preserved and constructed natural environment, as well as good governance and good levels of physical health, economy and subjective well-being, as highlighted by [46]. The same authors conclude that, consequently, the interactions between human beings and their physical and social environment should create high levels of satisfaction with these factors, besides well-being and happiness, if these interactions are pro-sustainable—that is, if they are committed with aspects concerning sustainability issues in their daily lives, such as shared value, social welfare and environmentally friendly practices. Furthermore, Moser [50] claimed that a pro-sustainable relationship with the social and physical environment results in satisfying humans' needs and conserving that same environment. Taking care of the environment, conserving and preserving it, is a commitment that all organizations will be urged to make in the short term because it raises the QoL of individuals in the workplace (microenvironment) and those who inhabit the global space (macroenvironment) [51]. SD practices imply the improvement of QoL through satisfaction with many aspects of life, such as education, justice, community participation and recreation [52]. Thus, environmental, cultural and economic factors can interfere with the degree of satisfaction with life, especially if biological needs, safety aspects, social aspects, and psychological aspects have been minimally affected [53].

HEIs contribute to SD through their teaching, research, extension and management practices [54]. Following the statements of [55], a sustainable HEI is one that values the quality of teaching, implements practices aimed at improving the quality of academic life (QAL) and is concerned about managing the use of natural resources. Therefore, in the perspective expressed in [56], HEIs should integrate the principles and practices of sustainability, as that vision and institutional orientation is revealed to be important in undertaking a necessary process of awareness among the academic community and to help decision-making, planning and operational processes.

The psychology of sustainability and SD [57] looks at sustainability not only in terms of the ecological and socio-economic environment, but also in terms of improving everyone's QoL, as mentioned in [58]. In this line of thought, the same authors highlighted that it is essential to analyse the quality of working life (QWL), as professional activity plays a fundamental role in determining employees' physical and mental health and well-being. Similarly, in [59] it was claimed that SD can only materialize in work environments that promote employees' well-being.

As an indicator of well-being, QoL is, today, also an extremely important factor [9], as in its wider sense it involves the components of individuals' lives related to their financial situation, health, interaction with the environment, social relations, affective life, leisure, satisfaction with life and other aspects. QoL is a concept that has inspired much research in the last few decades and had a strong influence on social and political trends applied to various fields, such as urban and regional planning, health promotion and also in social and economic investigation [60].

The literature available in this field can be divided into two types of studies: (i) the studies that consider QoL as a set of purely economic factors (GDP per capita, cost of living, employment, scale economies, etc.), determinants of the growth, decline and competitiveness of organisations [61]; and (ii) as a set of non-economic factors, as a subject of research in the quality of academic life of students (QAL) (satisfaction with services, emotions felt in campus, etc.), e.g., [62–68], or as a factor for assessing quality of work life (needs for satisfaction in a physical and emotional line) (QWL) [69–73].

Some studies demonstrate the relationship between HEIs' IC and SD [7,22,74], and between HEIs' IC and QoL [9,75], but after checking some recent literature reviews regarding IC [19] and searching the most renowned databases (e.g., Web of Science and Scopus), there were no studies which aimed to simultaneously analyse IC, SD and QoL in HEIs, considering their stakeholders' perceptions.

The SD practices can be related to QoL. For example, the social dimension of SD in the HEI context is associated with the quality of work and the quality of life in the academic community [10]; SD in HEIs is a type of development that ensures individuals' QoL through the conservation and preservation of the environment [54]. For example, in [50] it is stated that problems related to noise and environmental pollution are frequently mentioned by individuals as threats to their QoL [76]. If HEIs promote SD practices on campus, such as noise reduction, diminishing the use of paper and recycling campaigns by providing containers for this purpose, they can contribute to greater satisfaction among students.

Recent years have witnessed an exponential increase in the number of studies on QoL in educational environments in relation to the different individuals and groups therein [63,67,68,77–79], more specifically in the areas of students' QAL, e.g., [64–68] and the QWL of teachers and researchers [70,71]. QAL can be assessed in terms of feelings of global satisfaction with the student's experience of life at university [80]. QAL concerns the degree of need for satisfaction and the experiences that create positive emotions in the context of university life experienced by students [81]. Furthermore, the QAL corresponds to a sub-domain of QoL in general, expressed through the satisfaction revealed with the domain of university life [63,80]. These same authors conceptualized QAL as students' general feeling of satisfaction with the experience of university life through the presence of positive sentiments and the absence of negative ones.

QAL has also been measured as a composite of cognitive assessment, i.e., satisfaction of needs in life in the HEI, and affective assessment, referring to positive and negative affective experiences occurring throughout the period of studies at the HEI [64–68] This study adopts the view proposed in [80] regarding QAL, for whom this is defined according to the global feelings of satisfaction a student experiences in relation to university life. As QAL is measured through the determinants of satisfaction with HEI life [68], these SD practices are expected to contribute positively to students' QAL.

According to some studies, SD has a relationship with QoL [46], and with QAL [10]. If QAL measures students' QoL in the HEI context, then QAL can supposedly be affected by HEIs' SD practices. As mentioned, no studies are known to relate HEIs' sustainable development to students' QAL. For greater understanding of this connection, the following research hypothesis is formulated:

**Hypothesis 2 (H2).** *Sustainable development practices in HEIs have a positive and significant influence on students' QAL.*

QWL considers the organisational environment according to a wide range of needs for staff well-being at the workplace [69,82]. QWL has a multi-layered, dynamic structure covering different concepts such as safety at work, reward systems, workflows, opportunities for educational and work development, and participation in decision-making processes [70].

In [69], it was stated that QWL describes human resources' satisfaction of seven principal needs, namely health and safety, economic and family, social, esteem, self-updating, knowledge and aesthetic needs. However, in [80], these measures were conceptualized for updating QWL in terms of satisfaction composed of two sets of needs. Firstly, we have the composite of satisfaction of lower order needs, which includes satisfaction of health and safety needs, as well as satisfaction with economic and family needs. Secondly, we consider the composite of higher order needs, which includes satisfaction of social, esteem, self-updating, knowledge and aesthetic needs. These authors argued that the examination of the relative effectiveness of higher and lower order needs helps to prioritize the satisfaction of workers' needs. This method was also validated in [71].

QWL has been studied and defined by various authors e.g., [69,80,83,84]. However, the present study focuses specifically on HEIs, using the definition proposed in [85] for conceptualizing QWL—that

is, the staff's satisfaction with a variety of needs through resources, activities and results arising from participation in the workplace; and for measures of QWL, the updated needs proposed by the first authors were stated in [86]. Various studies in the field of QWL dealt with HEI teachers/researchers [70,71,73], but so far no studies are known to have dealt with the relationship between sustainable development practices in HEIs and the QWL of teachers/researchers, and so this is an innovative approach with potential interest for both researchers and HEI managers.

As already stated, SD affects QoL [46]. For example, recycling paper and other office material can make people feel that they are contributing to improving the state of the planet, and, as such, feel prouder of the place they work in, i.e., greater satisfaction and, therefore, a better QWL. A similar feeling is hoped for when the HEI contributes proactively to the balanced development of society through actions of social responsibility. A widely used definition of social responsibility for SD is that of the World Business Council [87], according to which corporate social responsibility is organisations' continued commitment to behave ethically and contribute to economic development, improving the QoL of the workforce and their families, as well as that of the local community and society in general. For example, in [88], the social dimension of SD was positioned as a motivational factor for the staff working in the organisation. Therefore, teachers and researchers' involvement in actions to help the community will make them feel better and consequently have a better QWL.

If QWL is people's response or affective reaction to the organisational system [89] and measures teachers and researchers' QoL in the HEI context, then QWL can supposedly be affected by HEIs' sustainable development. To deepen the understanding of this connection, the following research hypothesis is considered:

**Hypothesis 3 (H3).** *Sustainable development practices in HEIs have a positive and significant influence on the QWL of teachers and researchers.*

Considering the literature review and the research hypotheses formulated, two models of analysis are proposed in Figure 1. Model 1 is concerned with students' perceptions, and Model 2 relates to teachers and researchers' perceptions.

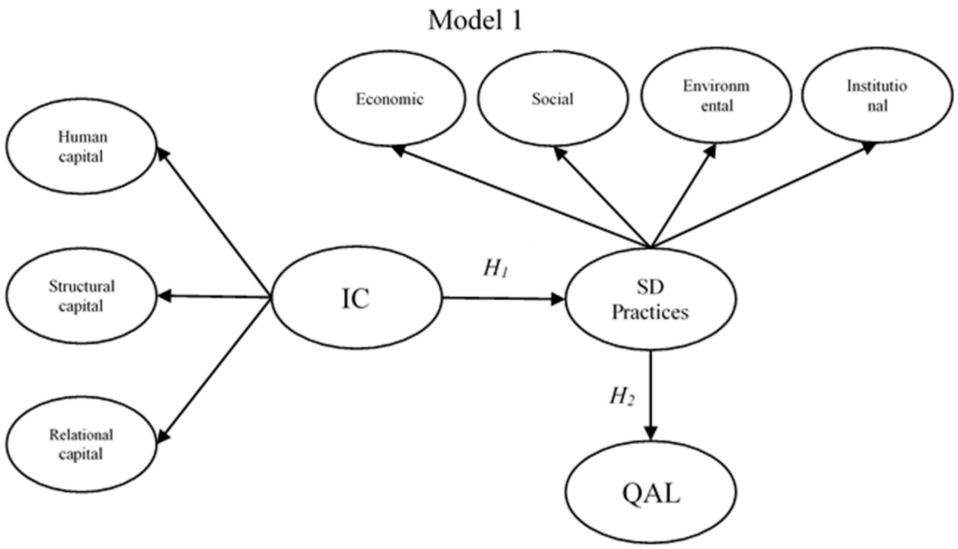


**Figure 1.** *Cont.*

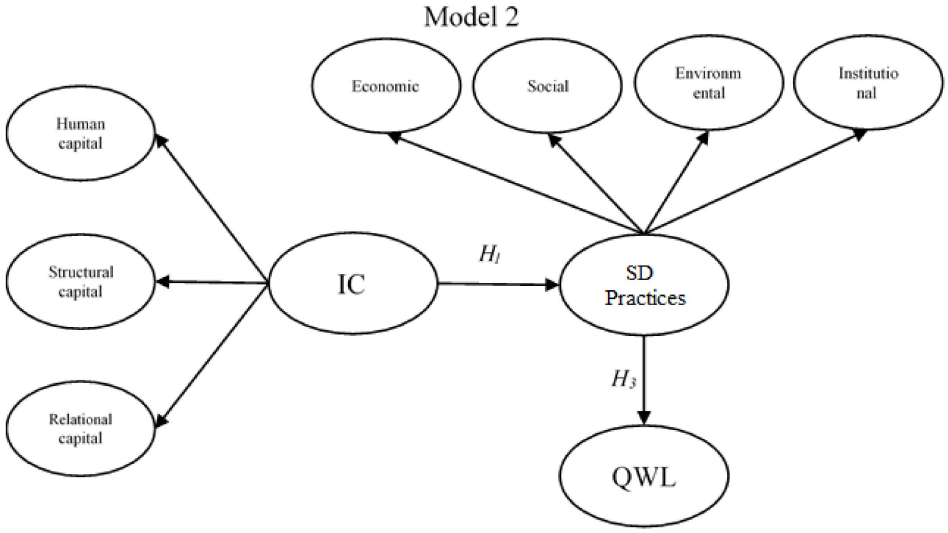


**Figure 1.** Influence of higher education institutions' (HEIs) intellectual capital (IC) on their own sustainable development practices and on students' quality of academic life (QAL) and teachers/researchers' quality of working life (QWL). Source: Own elaboration.

## 4. Research Methodology

With the motivation of accomplishing the objectives, this study was analytical and correlational, because it sought to explore the variables and the relationships between them, and it was cross-sectional because the samples were taken in a single period. The purpose of the study was descriptive because it aimed to discriminate the determining factors possibly associated with the phenomenon under study [90]. Through a quantitative, objectivist and, therefore, deductive approach, this research was supported by models built on results and previous research, with quantitative indicators collected through a questionnaire.

### *4.1. Unit of Analysis*

The subject of study corresponded to the entirety of the diverse internal and external stakeholders of Portuguese State HEIs. Based on [91], students and teachers/researchers were selected for this study, given their importance and relevance for the study objectives. The selection of this population was justified as it ensured a diversified sample with the representation of one HEI per region NUTS II level (The Nomenclature of Territorial Units for Statistics (NUTS) is developed by Eurostat, and employed in Portugal for statistical purposes (https://ec.europa.eu/eurostat) and considered the entirety of these seven HEIs as a suitable laboratory to test the effects of IC on QAL and QWL. Due to limitations, in terms of data access, the sample's design incorporated seven HEIs, for the total number of seven NUTS II regions in Portugal, in order to ensure the total geographical coverture of Portugal, including five regions from continental Portugal: North, Centre, Metropolitan area of Lisbon, Alentejo, and Algarve, and also two autonomous regions: Madeira and Azores.

The Portuguese higher education system (public and private) is a binary system, where we can find the university education that is oriented towards the supply of solid scientific formation, joining efforts and competences of teaching and research units and the polytechnic education that is concentrated especially on applied sciences, vocational training and advanced, professionally-oriented technical training. In the current study, the decision was taken to focus on public university education, since they correspond to the dominant share of institutions providing higher education and research services in Portugal; this option facilitated the comparative analysis and representativeness of the results.

### *4.2. Instrument for Data Collection and Variables*

Quantitative data were collected through a Questionnaire A, for students, and a Questionnaire B, for teachers/researchers, resorting to structured, closed questions. A seven-point Likert scale was used for the answers. This scale seems to be the most correct in this study as the respondents build acceptance levels according to their experiences and social influences, giving the opportunity to give clear answers instead of neutral or ambiguous answers. This type of scale has already been used in similar studies related to IC, e.g., [20], QAL, e.g., [68], and QWL, e.g., [71].

Both questionnaires were pre-tested to ensure that all the questions were understood and accepted in the same way by all respondents. Subsequently, some of the items of both questionnaires were adapted to improve comprehension.

#### 4.2.1. Variables for IC

IC was measured considering the dominant triad formed of human capital (HC), structural capital (SC) and relational capital (RC), in line with the multidimensional analysis suggested in [19]. To determine the type of IC indicators, the methodological design proposed in [92] was followed. The 32 key indicators used for IC are presented in Supplementary Materials Annex 2.

#### 4.2.2. Variables for Sustainable Development

The variables to measure the SD practices in HEIs are based on the study developed in [10]. The dimensions used are economic, environmental, social and organisational (see Supplementary Materials Annex 2).

#### 4.2.3. Variables for QAL

Concerning QAL, as mentioned in the literature review, previous studies such as [64,65,68] were the cornerstones.

For the cognitive component, the scale proposed in [64,65] was adopted; and for the affective component, the criterion adopted in [64,65] was used, resorting to the scale proposed in [93]. Both criteria (cognitive component, affective component) have already been used and validated in previous studies, such as [67,68] (see Supplementary Materials Annex 2).

#### 4.2.4. Variables for QWL

As for QWL, several studies were considered, e.g., [69,71,80], incorporating the correspondent adjustments (see Supplementary Materials Annex 2).

### *4.3. Sample and Data Collection Procedure*

The definitive sample was collected between November 2017 and February 2018, in two phases. In the first phase, the questionnaires were sent by e-mail to seven Portuguese HEIs (see Table 1), via the Communication and Image Department at the University of Beira Interior. This e-mail, containing a link to the questionnaire, explained the purpose of the study, ensuring that participation was voluntary, anonymous and confidential.

In the second phase, as the first phase did not result in a representative sample, some paper questionnaires were administered in the classroom. The potential bias of students' non-response was assessed through *t*-tests, with no significant differences being observed between the two groups.

The participants in this study were 749 students and 587 teachers/researchers, having eliminated eleven student questionnaires as they were not correctly completed. The final sample comprised 738 students and 587 teachers/researchers (Supplementary Materials Annex 3 shows the sample characterisation with distribution of respondent students and teachers/researchers by HEI, area of study, gender and age group).

**Table 1.** HEIs, geographical area of location, weight by HEI, total of students (S) and teachers/researchers (T/R) samples.

| HEIs | Region | Weight HEIs (%) | | Total Sample Collected | | Optimum Sample Size * | |
|---|---|---|---|---|---|---|---|
| | (NUTS II) | S | T/R | S | T/R | S | T/R |
| ISCTE-Instituto U. Lisboa | Metropolitan Area of Lisbon | 16.67 | 13.1 | 118 | 77 | 109 | 70 |
| U Açores | Autonomous Region of Açores | 5.29 | 6.6 | 48 | 39 | 35 | 30 |
| U. Algarve | Algarve | 14.61 | 10.7 | 98 | 64 | 96 | 64 |
| U. Beira Interior | Centre | 12.86 | 17.6 | 132 | 105 | 84 | 105 |
| U. Évora | Alentejo | 12.16 | 13.8 | 88 | 82 | 80 | 83 |
| U. Madeira | Autonomous Region of Madeira | 5.27 | 6,8 | 35 | 41 | 35 | 41 |
| U. Minho | North | 33.14 | 31.4 | 219 | 179 | 217 | 173 |
| Total | | 100 | 100 | 738 | 587 | 656 | 566 |

Legend: S = Students; T/R = Teachers/Researchers. * The optimal sample size to be collected at each participating HEI was determined for a confidence level of 99% and considering a sampling error of 5%, as proposed by [94]. Source: Own elaboration.

## 5. Presentation and Discussion of the Results

Prior to the analysis of the evidence provided by Model 1 and Model 2, the descriptive statistics of the variables studied were contemplated, as well as the distribution of the mean values in relation to students and teachers/researchers, which was found to be quite homogeneous in both models. The correlational relation between the control variables was also analysed. The results, presented in Table 2, show that the distribution of the mean values is quite homogeneous and all the correlations are statistically significant ($p < 0.01$), with values below or very close to 0.750, not indicating potential problems of autocorrelation.

**Table 2.** Descriptive statistics and correlation between variables Model 1 and Model 2.

| Model 1 | Human Capital | Structural Capital | Relational Capital | Economic | Environmental | Social | Organisational | QAL |
|---|---|---|---|---|---|---|---|---|
| Human capital | 1 | | | | | | | |
| Structural capital | 0.716 ** | 1 | | | | | | |
| Relational capital | 0.729 ** | 0.835 ** | 1 | | | | | |
| Economic | 0.584 ** | 0.731 ** | 0.731 ** | 1 | | | | |
| Environmental | 0.560 ** | 0.618 ** | 0.651 ** | 0.627 ** | 1 | | | |
| Social | 0.492 ** | 0.594 ** | 0.582 ** | 0.650 ** | 0.591 ** | 1 | | |
| Organisational | 0.694 ** | 0.742 ** | 0.804 ** | 0.697 ** | 0.690 ** | 0.572 ** | 1 | |
| QAL | 0.586 ** | 0.532 ** | 0.577 ** | 0.444 ** | 0.468 ** | 0.407 ** | 0.609 ** | 1 |
| Average | 4.836 | 4.752 | 4.905 | 4.634 | 5.240 | 4.890 | 5.119 | 4.836 |
| Variance | 0.560 | 0.962 | 1.005 | 1.145 | 1.430 | 1.542 | 1.470 | 0.560 |
| **Model 2** | **Human Capital** | **Structural Capital** | **Relational Capital** | **Economic** | **Environmental** | **Social** | **Organisational** | **QWL** |
| Human capital | 1 | | | | | | | |
| Structural capital | 0.736 ** | 1 | | | | | | |
| Relational capital | 0.688 ** | 0.824 ** | 1 | | | | | |
| Economic | 0.652 ** | 0.737 ** | 0.796 ** | 1 | | | | |
| Environmental | 0.473 ** | 0.619 ** | 0.698 ** | 0.678 ** | 1 | | | |
| Social | 0.435 ** | 0.545 ** | 0.603 ** | 0.582 ** | 0.528 ** | 1 | | |
| Organisational | 0.422 ** | 0.569 ** | 0.586 ** | 0.610 ** | 0.582 ** | 0.565 ** | 1 | |
| QAL | 0.349 ** | 0.391 ** | 0.391 ** | 0.398 ** | 0.404 ** | 0.228 ** | 0.284 ** | 1 |
| Average | 4.256 | 4.187 | 4.450 | 4.802 | 5.040 | 4.600 | 4.377 | 4.736 |
| Variance | 0.705 | 0.995 | 0.931 | 1.133 | 1.782 | 2.036 | 1.321 | 0.929 |

** The correlation is significant at the level of 0.01 (2 extremities). Source: Own elaboration.

The data were analysed using a selected specification of a structural equation model (SEM), using the partial least squares (PLS) method, SEM–PLS. Considering the statement presented by Hair et al. [95], the PLS assumes no distribution to the data and is relatively robust against distribution deviations. However, the same authors stated that researchers should still examine PLS–SEM results

carefully when distributions deviate substantially from normal. In accordance with this, absolute skewness and/or kurtosis values of greater than one are indicative of non-normal data. Taking into account what was mentioned by Hair el al. [95], in this case, regarding skewness and kurtosis statistics, they do not provide evidence of a non-normal distribution. In both models, the kurtosis and skewness values of the indicators are within the acceptable range of −1 and +1. The only exception is the ORG indicator, in M1, which has a skewness of −1.113 and a kurtosis of 1.365, and thus exhibits a slight degree of non-normality. However, as the degree of skewness and kurtosis is not severe and because ORG is one of four indicators measuring the (reflexive) SD construct, this deviation from normality is not considered a problem and the indicator is retained.

The variance inflation factor (VIF) was also used to diagnose collinearity, and it was found that the variance value of each indicator is no higher than 2.7, signalling no potential multicollinearity issues.

### *5.1. Model Estimation*

According to the procedures defined in [95], SEM–PLS is used mainly to develop theories in exploratory studies focusing on explaining the variance in dependent variables when examining the model. SmartPLS (v 3.2.7) software [96] was used to estimate the parameters, using bootstrapping of 5000 samples to obtain their significance [95].

The PLS model was assessed in three stages: (i) assessment of the global model was determined; (ii) the reliability/validity of the measurement model was checked; and (iii) the meaning of the paths (relations between constructs) within the structural model was assessed [97].

The initial measurement model of this study denotes reflexive characteristics (see Supplementary Materials Annex 2), containing two multidimensional constructs (second-order constructs) and nine latent variables (first-order constructs) that cannot be observed or measured directly, and can only be inferred through their observable variables, i.e., the forty-five indicators (see Supplementary Materials Annex 1).

After determining the values and adjusting the constructs of QAL and QWL, considering the literature review, the two models proposed were analysed. As in both models there is a second-order construct, this analysis will follow a two-step approach as recommended by [98], that is: (i) treatment of M1 and M2 only with the first-order constructs (models M1a and M2a); and (ii) treatment of the models incorporating the aggregate scores as an indicator of the second-order constructs (Models M1b and M2b).

Stage 1: Treatment of Models M1a and M2a. In this stage, the global model and measurement model will be analysed.

Assessment of the global model requires the use of quality adjustment measures. After estimating the two models (M1a and M2a) using SmartPls [96], it was found necessary to adjust both models, since the values presented did not agree with recommendations in the literature of reference. It was found adequate to drop the indicators with the smallest loading values that were detracting from the result. The models were estimated until the standardized root mean square residual (SRMR) value in both models reached the cut-off value of >0.08 [99]. Regarding M1a, the indicators of HC3, HC5, HC6, HC7, HC8, HC9, SC7, RC2, RC3 and RC8 were withdrawn; and from M2a the indicators of HC1, HC3, HC4, HC5, HC7, HC8, HC9, HC10, SC1, SC2, SC3, SC7, SC8, SC10, RC1, RC2, RC3 and RC4 were withdrawn. Figure 2 shows the final M1a and M2a models.

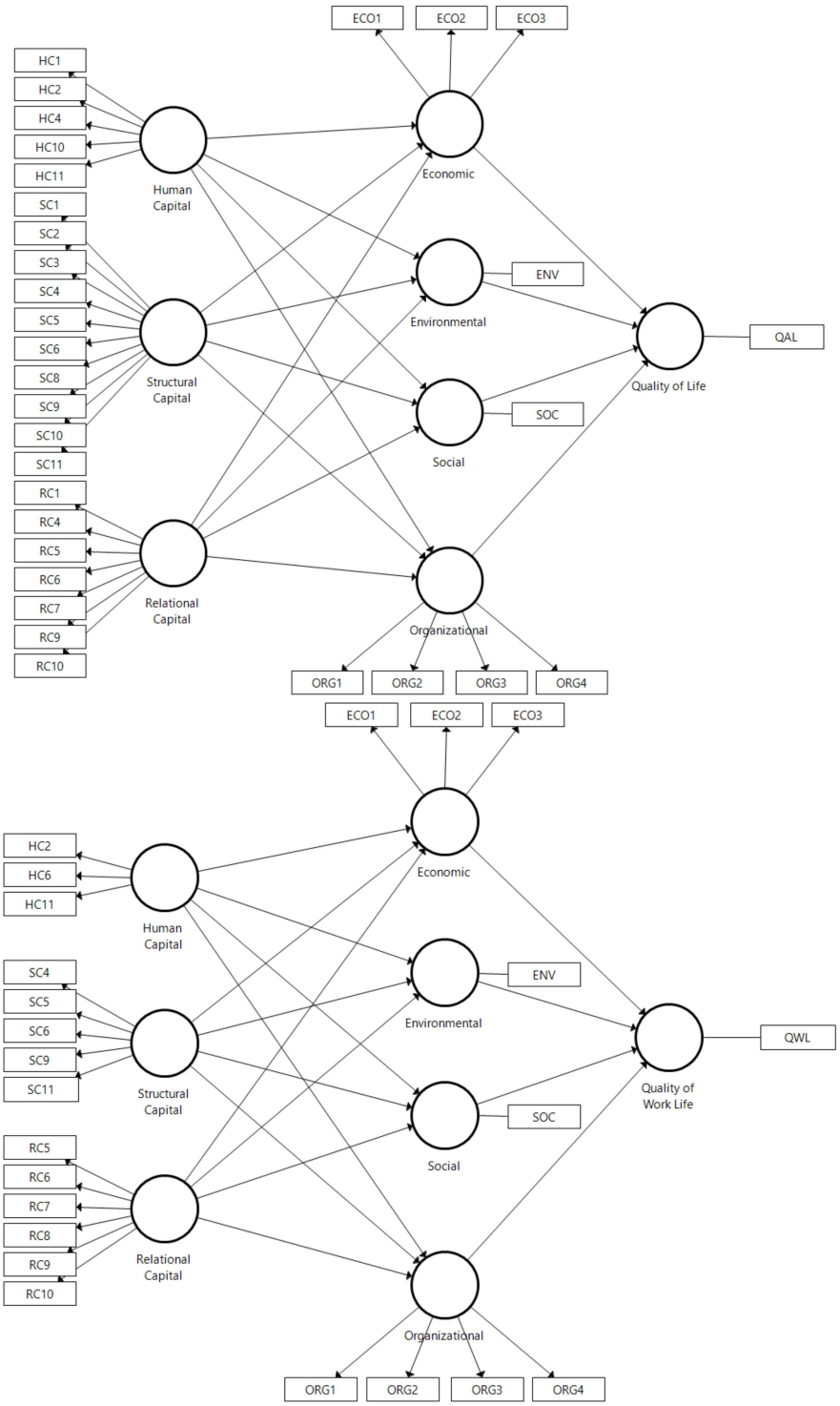


**Figure 2.** Models M1a and M2a adjusted only with the first-order constructs relations. Source: Own elaboration.

As observed in Table 3, the original SRMR value in both models was <0.08 [99] and all the deviations were insignificant because 95% of the bootstrap quantile (HI95) of the value of the three measures were greater than the original values [97].

**Table 3.** Quality of adjustment (estimated model and saturated model).

| Fit Measures | Original Value | | HI95 | |
|---|---|---|---|---|
| | M1a | M2a | M1a | M2a |
| *SRMR* | 0.059 | 0.069 | 0.064 | 0.077 |
| *dULS* | 1.866 | 1.444 | 2.171 | 1.790 |
| *dG* | 0.630 | 0.825 | 0.703 | 0.893 |

Legend: *SRMR*: Standardized root mean square residual; *dULS*: unweighted least squares discrepancy; *dG*: geodesic discrepancy. Source: Own elaboration.

In the assessment of the measurement model, only the reflexive indicators will be analysed, because the models do not have formative indicators. All the measures have as reference the recent studies of [100,101].

In the analysis of reflexive indicators, consideration should be given to: (i) reflexive indicator loadings; (ii) internal consistency reliability; (iii) convergent validity; and (iv) assessment of discriminant validity.

Regarding the loading values (see Table 4) of M1a and M2a, all the indicators are seen to present values above 0.70, as recommended, except for one indicator from M2a. However, as this indicator is close to 0.70, we decided to retain it, in agreement with the recommendation present in [102,103] by considering that it is necessary in the model.

Table 4 also presents the results of the analysis of internal consistency reliability, as well as the Cronbach alpha value. Interpretation of the coefficients of these analyses should also not present values under 0.70 (or 0.60 in exploratory research). All the variables also satisfy the requirements of the Dijkstra–Henseler indicator ($\rho A$) (*rho_A*), since the values obtained by calculating the indicator are above the reference of 0.70.

The assessment of convergent validity is through the average variance extracted (AVE), which must be equal to or above 0.50. The result, presented in the same table, shows that the AVE value agrees with the literature of reference, i.e., above 0.5.

The discriminant validity is better detected through the calculation of the heterotrait–monotrait (HTMT) ratio, which for conceptually similar constructs must be HTMT < 0.90, and, for conceptually different constructs, HTMT < 0.85. Table 5 confirms that the result of this last analysis also agrees with the authors' recommendation, except for two values in both models that are very close to 0.90. In addition to these guidelines, to complement this result, researchers can formally test whether the HTMT value is significantly lower than unity (1) using bootstrapping, and in both cases Table 6 confirms that the result of this last analysis also agrees with these authors' recommendations, i.e., no interval has the value of one.

**Table 4.** Analysis of the measuring model (loadings, internal consistency and reliability, Dijkstra–Henseler indicator, composite reliability and average variance extracted (AVE) of models M1a and M2a.

| *M1a* | | | | | | *M2a* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Variable/ Indicator | Loading | Cronb. Alpha | Rho_A | pc | AVE | Variable/ Indicator | Loading | Cronb. Alpha | Rho_A | Pc | AVE |
| HC | | 0.815 | 0.830 | 0.870 | 0.573 | HC | | 0.727 | 0.734 | 0.848 | 0.654 |
| HC1 | 0.742 | | | | | HC2 | 0.869 | | | | |
| HC2 | 0.729 | | | | | HC6 | 0.679 | | | | |
| HC4 | 0.733 | | | | | HC11 | 0.863 | | | | |
| HC10 | 0.820 | | | | | SC | | 0.852 | 0.855 | 0.895 | 0.631 |
| HC11 | 0.757 | | | | | SC11 | 0.747 | | | | |
| SC | | 0.910 | 0.912 | 0.925 | 0.554 | SC4 | 0.821 | | | | |
| RC1 | 0.781 | | | | | SC5 | 0.834 | | | | |
| RC10 | 0.774 | | | | | SC6 | 0.854 | | | | |
| RC4 | 0.720 | | | | | SC9 | 0.705 | | | | |
| RC5 | 0.801 | | | | | RC | | 0.862 | 0.867 | 0.897 | 0.591 |
| RC6 | 0.791 | | | | | RC10 | 0.799 | | | | |
| RC7 | 0.801 | | | | | RC5 | 0.814 | | | | |
| RC9 | 0.804 | | | | | RC6 | 0.771 | | | | |

**Table 4.** *Cont.*

| *M1a* | | | | | | *M2a* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variable/ Indicator** | **Loading** | **Cronb. Alpha** | **Rho_A** | **pc** | **AVE** | **Variable/ Indicator** | **Loading** | **Cronb. Alpha** | **Rho_A** | **Pc** | **AVE** |
| RC | | 0.894 | 0.896 | 0.917 | 0.612 | RC7 | 0.755 | | | | |
| RC1 | 0.729 | | | | | RC8 | 0.703 | | | | |
| RC2 | 0.701 | | | | | RC9 | 0.768 | | | | |
| RC3 | 0.780 | | | | | ECO | | 0.760 | 0.807 | 0.861 | 0.674 |
| RC4 | 0.702 | | | | | ECO1 | 0.797 | | | | |
| RC5 | 0.735 | | | | | ECO2 | 0.894 | | | | |
| RC6 | 0.760 | | | | | ECO3 | 0.767 | | | | |
| RC7 | 0.745 | | | | | ENV | 1.000 | | | | |
| RC8 | 0.810 | | | | | SOC | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| RC9 | 0.749 | | | | | ORG | | | | | |
| RC10 | 0.724 | | | | | ORG1 | 0.864 | | | | |
| ECO | | 0.820 | 0.838 | 0.892 | 0.734 | ORG2 | 0.841 | | | | |
| ECO1 | 0.882 | | | | | ORG3 | 0.884 | | | | |
| ECO2 | 0.885 | | | | | ORG4 | 0.805 | | | | |
| ECO3 | 0.801 | | | | | QWL | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| ENV | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | | | | | | |
| SOC | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | | | | | | |
| ORG | 0.921 | 0.922 | 0.944 | 0.808 | 0.921 | | | | | | |
| ORG1 | 0.908 | | | | | | | | | | |
| ORG2 | 0.907 | | | | | | | | | | |
| ORG3 | 0.897 | | | | | | | | | | |
| ORG4 | 0.883 | | | | | | | | | | |
| QAL | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | | | | | | |

Source: Own elaboration.

**Table 5.** Heterotrait–monotrait (HTMT) ratio of models M1a and M2a.

| **M1a** | **HC** | **SC** | **RC** | **ECO** | **ENV** | **SOC** | **ORG** | **QAL** |
|---|---|---|---|---|---|---|---|---|
| HC | | | | | | | | |
| SC | 0.905 | | | | | | | |
| RC | 0.854 | 0.925 | | | | | | |
| ECO | 0.776 | 0.844 | 0.852 | | | | | |
| ENV | 0.555 | 0.652 | 0.685 | 0.694 | | | | |
| SOC | 0.526 | 0.870 | 0.608 | 0.720 | 0.591 | | | |
| ORG | 0.715 | 0.814 | 0.623 | 0.801 | 0.719 | 0.597 | | |
| QAL | 0.238 | 0.263 | 0.280 | 0.186 | 0.220 | 0.168 | 0.300 | |
| **M2a** | **HC** | **SC** | **RC** | **ECO** | **ENV** | **SOC** | **ORG** | **QAL** |
| HC | | | | | | | | |
| SC | 0.901 | | | | | | | |
| RC | 0.888 | 0.906 | | | | | | |
| ECO | 0.565 | 0.676 | 0.689 | | | | | |
| ENV | 0.672 | 0.709 | 0.738 | 0.673 | | | | |
| SOC | 0.559 | 0.563 | 0.640 | 0.652 | 0.527 | | | |
| ORG | 0.818 | 0.835 | 0.883 | 0.754 | 0.731 | 0.626 | | |
| QWL | 0.059 | 0.065 | 0.093 | 0.068 | 0.116 | 0.033 | 0.092 | |

Source: Own elaboration.

**Table 6.** Heterotrait–monotrait (HTMT) ratio of models M1a and M2a using bootstrapping.

| Variables M1a | Original Sample (O) | Sample Mean (M) | 2.5% | 97.5% | Original Sample (O) | Sample Mean (M) | Bias | 2.5% | 97.5% |
|---|---|---|---|---|---|---|---|---|---|
| HC -> ECO | 0.103 | 0.105 | 0.018 | 0.197 | 0.103 | 0.105 | 0.002 | 0.016 | 0.195 |
| HC -> ENV | −0.039 | −0.040 | −0.139 | 0.061 | −0.039 | −0.040 | −0.001 | −0.139 | 0.061 |
| HC -> SOC | −0.009 | −0.008 | −0.114 | 0.098 | −0.009 | −0.008 | 0.000 | −0.114 | 0.098 |
| HC -> ORG | 0.000 | 0.000 | −0.080 | 0.076 | 0.000 | 0.000 | 0.000 | −0.081 | 0.075 |
| SC -> ECO | 0.341 | 0.342 | 0.229 | 0.450 | 0.341 | 0.342 | 0.001 | 0.227 | 0.447 |
| Structural Capital -> Environmental | 0.306 | 0.307 | 0.177 | 0.434 | 0.306 | 0.307 | 0.001 | 0.173 | 0.430 |
| Structural Capital -> Organisational | 0.292 | 0.293 | 0.179 | 0.410 | 0.292 | 0.293 | 0.001 | 0.177 | 0.406 |
| Structural Capital -> Social | 0.379 | 0.380 | 0.232 | 0.521 | 0.379 | 0.380 | 0.001 | 0.227 | 0.518 |
| Relational Capital -> Economic | 0.374 | 0.372 | 0.269 | 0.476 | 0.374 | 0.372 | −0.002 | 0.274 | 0.480 |
| Relational Capital -> Environmental | 0.422 | 0.421 | 0.303 | 0.541 | 0.422 | 0.421 | −0.001 | 0.305 | 0.542 |
| Relational Capital -> Organizational | 0.548 | 0.547 | 0.442 | 0.650 | 0.548 | 0.547 | −0.001 | 0.444 | 0.650 |
| Relational Capital -> Social | 0.266 | 0.265 | 0.132 | 0.396 | 0.266 | 0.265 | −0.001 | 0.134 | 0.399 |
| ECO -> QAL | −0.081 | −0.080 | −0.208 | 0.052 | −0.081 | −0.080 | 0.001 | −0.211 | 0.049 |
| ENV -> QAL | 0.056 | 0.056 | −0.039 | 0.152 | 0.056 | 0.056 | 0.000 | −0.039 | 0.152 |
| SOC -> QAL | 0.017 | 0.018 | −0.072 | 0.106 | 0.017 | 0.018 | 0.001 | −0.074 | 0.104 |
| ORG -> QAL | 0.297 | 0.297 | 0.184 | 0.408 | 0.297 | 0.297 | 0.000 | 0.184 | 0.407 |
| **Variables M2a** | **Original Sample (O)** | **Sample Mean (M)** | **2.5%** | **97.5%** | **Original Sample (O)** | **Sample Mean (M)** | **Bias** | **2.5%** | **97.5%** |
| Economic -> Quality of Work Life | −0.005 | −0.005 | −0.102 | 0.094 | −0.005 | −0.005 | 0.000 | −0.103 | 0.093 |
| Environmental -> Quality of Work Life | 0.120 | 0.120 | 0.015 | 0.226 | 0.120 | 0.120 | 0.000 | 0.016 | 0.226 |
| Human Capital -> Economic | −0.122 | −0.121 | −0.227 | −0.020 | −0.122 | −0.121 | 0.001 | −0.229 | −0.022 |
| Human Capital -> Environmental | 0.038 | 0.039 | −0.061 | 0.140 | 0.038 | 0.039 | 0.001 | −0.061 | 0.138 |
| Human Capital -> Organizational | 0.090 | 0.091 | −0.002 | 0.184 | 0.090 | 0.091 | 0.001 | −0.003 | 0.182 |
| Human Capital -> Social | 0.066 | 0.067 | −0.053 | 0.188 | 0.066 | 0.067 | 0.001 | −0.055 | 0.186 |
| Organisational -> Quality of Work Life | 0.034 | 0.034 | −0.084 | 0.152 | 0.034 | 0.034 | 0.000 | −0.084 | 0.152 |
| Relational Capital -> Economic | 0.379 | 0.380 | 0.270 | 0.489 | 0.379 | 0.380 | 0.001 | 0.267 | 0.486 |
| Relational Capital -> Environmental | 0.461 | 0.462 | 0.372 | 0.547 | 0.461 | 0.462 | 0.001 | 0.370 | 0.546 |
| Relational Capital -> Organisational | 0.522 | 0.522 | 0.438 | 0.599 | 0.522 | 0.522 | 0.000 | 0.434 | 0.596 |
| Relational Capital -> Social | 0.471 | 0.469 | 0.355 | 0.572 | 0.471 | 0.469 | −0.001 | 0.358 | 0.574 |
| Social –> Quality of Work Life | −0.047 | −0.047 | −0.158 | 0.066 | −0.047 | −0.047 | 0.001 | −0.160 | 0.065 |
| Structural Capital -> Economic | 0.360 | 0.360 | 0.240 | 0.477 | 0.360 | 0.360 | 0.000 | 0.239 | 0.476 |
| Structural Capital -> Environmental | 0.266 | 0.265 | 0.156 | 0.370 | 0.266 | 0.265 | −0.002 | 0.158 | 0.371 |
| Structural Capital -> Organisational | 0.241 | 0.241 | 0.139 | 0.345 | 0.241 | 0.241 | 0.000 | 0.140 | 0.345 |
| Structural Capital -> Social | 0.100 | 0.100 | −0.024 | 0.228 | 0.100 | 0.100 | 0.001 | −0.025 | 0.227 |

Source: Own elaboration.

Stage 2: Treatment of Models M1b and M2b. As the proposed model adopts a different nomological structure, as suggested in [98] after calculating the results of the first order model (Models M1a and M2a), the measurement model of the second order models needs to be tested (Models M1b and M2b). The second order constructs (intellectual capital and sustainable development) incorporate the respective score of the first order dimension produced by SmartPLS [96]. After this stage, the structural model can be estimated [103].

For the measurement model, the procedure is exactly as in Stage 1. Analysis of Table 7 confirms that all the values are within the established parameters (>0.70) or very close to that value. The same table presents the results of the analysis of internal consistency and reliability, as well as Cronbach's alpha and AVE values. According to the literature of reference mentioned in Stage 1, all the values are within normality.

As for the heterotrait–monotrait (HTMT) ratio, the values are also within normality (see Tables 8 and 9).

**Table 7.** Measuring model (loadings, internal consistency and reliability, Dijkstra-Henseler indicator, composite reliability and AVE) of models M1b and M2b.

| M1b | | | | | | M2b | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variable/ Indicator** | **Loading** | **Cronb. Alpha** | **Rho_A** | **pc** | **AVE** | **Variable/ Indicator** | **Loading** | **Cronb. Alpha** | **Rho_A** | **Pc** | **AVE** |
| IC | | 0.889 | 0.896 | 0.931 | 0.818 | IC | | 0.879 | 0.890 | 0.925 | 0.805 |
| HC | 0.879 | | | | | HC | 0.876 | | | | |
| SC | 0.926 | | | | | SC | 0.917 | | | | |
| RC | 0.908 | | | | | RC | 0.897 | | | | |
| SD | | 0.858 | 0.870 | 0.903 | 0.700 | SD | | 0.848 | 0.866 | 0.897 | 0.686 |
| ECO | 0.859 | | | | | ECO | 0.812 | | | | |
| ENV | 0.823 | | | | | ENV | 0.853 | | | | |
| SOC | 0.796 | | | | | SOC | 0.768 | | | | |
| ORG | 0.869 | | | | | ORG | 0.876 | | | | |
| QAL | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | QAL | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

Source: Own elaboration.

**Table 8.** Heterotrait–monotrait (HTMT) ratio of models M1b and M2b.

| **M1b** | **IC** | **SD** | **QWL** | **M2b** | **IC** | **SD** | **QWL** |
|---|---|---|---|---|---|---|---|
| IC | | | | IC | | | |
| SD | 0.887 | | | SD | 0.881 | | |
| QWL | 0.282 | 0.259 | | QWL | 0.070 | 0.100 | |

Source: Own elaboration.

**Table 9.** Heterotrait–monotrait (HTMT) ratio of models M1b and M2b using bootstrapping.

| **Variables M2a** | **Original Sample (O)** | **Sample Mean (M)** | **2.5%** | **97.5%** | **Original Sample (O)** | **Sample Mean (M)** | **Bias** | **2.5%** | **97.5%** |
|---|---|---|---|---|---|---|---|---|---|
| IC -> SD | 0.786 | 0.786 | 0.752 | 0.817 | 0.786 | 0.786 | 0.000 | 0.750 | 0.816 |
| SD -> QAL | 0.245 | 0.246 | 0.175 | 0.315 | 0.245 | 0.246 | 0.001 | 0.172 | 0.312 |
| **Variables M2b** | **Original Sample (O)** | **Sample Mean (M)** | **2.5%** | **97.5%** | **Original Sample (O)** | **Sample Mean (M)** | **Bias** | **2.5%** | **97.5%** |
| IC -> SD | 0.779 | 0.779 | 0.753 | 0.803 | 0.779 | 0.779 | 0.001 | 0.751 | 0.802 |
| SD -> QWL | 0.097 | 0.097 | 0.032 | 0.160 | 0.097 | 0.097 | 0.000 | 0.031 | 0.159 |

Source: Own elaboration.

With no formative indicators to analyse, the structural model is assessed below.

### *5.2. Assessment of the Structural Model*

Primary assessment of the structural model is carried out considering two assessment criteria, namely the determination coefficient statistic ($R^2$), which measures the degree of model adjustment, and the statistical significances of the path coefficients [100,101]. As analysing structural equations through the PLS method consists of maximizing the value of the explained variance of the endogenous latent variables, the $R^2$ value of the constructs should present a high value [100,101].

Regarding the estimation of the effect size ($f^2$), according to [104] the reference values are: $0.02 \leq f^2 < 0.15$: small effect; $0.15 \leq f^2 < 0.35$: moderate effect; $f^2 \geq 0.35$: large effect.

The Stone–Geisser ($Q^2$) test is used as a criterion to measure the predictive relevance of the reflexive dependent constructs [105]. As in $f^2$, values of 0.02, 0.15 and 0.35 indicate that an exogenous construction has small, moderate or large predictive relevance in a given endogenous construction.

Analysing the values presented in Table 10, the results confirm that the structural model of both models presents acceptable predictive relevance ($R^2$) for SD and weak for QAL and QWL, and that the values, also presented in this table for $f^2$ and $Q^2$, are in accordance with the above-mentioned criteria.

**Table 10.** Determination coefficient ($R^2$), estimate of the size effects ($f^2$), and predictive relevance ($Q^2$) of models M1b and M2b.

| Variables | $R^2$ | | $f^2$ | | $Q^2$ | |
|---|---|---|---|---|---|---|
| | **M1b** | **M2b** | **M1b** | **M2b** | **M1b** | **M2b** |
| IC | | | 1.617 *** | 1.541 *** | | |
| SD | 0.618 | 0.606 | 0.064 ** | 0.009 * | 0.403 *** | 0.388 *** |
| QAL/QWL | 0.060 | 0.009 | | | 0.054 * | 0.008 * |

Legend: * $0.02 \leq f^2/Q^2 < 0.15$: small. ** $0.15 \leq f^2/Q^2 < 0.35$: moderate *** $f^2/Q^2 \geq 0.35$: large. Source: Own elaboration.

Concerning the robustness of the path coefficients, the reference value is above 0.2 [103,106]. The observation of Table 11 reveals that all the coefficients present a value above 0.2, meaning that there is robustness in the relationships tested, except for SD -> QWAL ($p = 0.097$). Considering the estimated values of the coefficients and corresponding $t$ values, there is good adjustment of the data used to estimate the model and test the hypotheses studied, in terms of structural relations. The final models are presented in Figure 3.

**Table 11.** Robustness of the coefficients and level of significance of the structural relations of models M1b and M2b.

| Structural Relations | Estimated Value | | Sample Mean | | Standard Deviation | | t-Value | |
|---|---|---|---|---|---|---|---|---|
| | **M1b** | **M2b** | **M1b** | **M2b** | **M1b** | **M2b** | **M1b** | **M2b** |
| $H_1$: IC -> SD | 0.786 † | 0.779 † | 0.786 | 0.779 | 0.017 | 0.015 | 47.328 *** | 51.124 *** |
| $H_2/H_3$: SD -> QAL/QWAL | 0.245 † | 0.097 | 0.246 | 0.097 | 0.036 | 0.039 | 6.804 *** | 2.473 ** |

Legend: † = Robustness of the coefficient because the value obtained is above 0.2. ** = level of significance 5% (>1.96) *** = level of significance 1% (≥2.58). Source: Own elaboration.

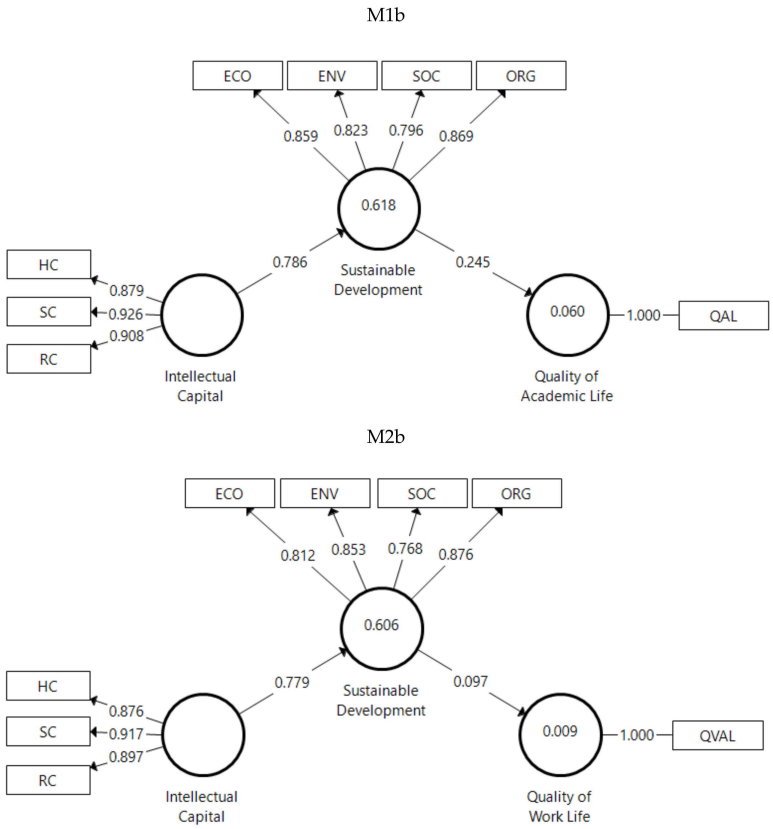


**Figure 3.** Complete final structural models of M1b and M2b, and the respective weights and loadings. Source: Own elaboration.

### *5.3. Contrasting Literature and Empirical Findings*

Regarding hypothesis 1, HEIs' IC has a direct and positive influence on HEIs' SD practices, and so this hypothesis is not rejected in either model (M1: 0.786; and M2: 0.779). Indeed, HEIs' IC is found to promote SD through the different dimensions of sustainability studied (economic, environmental, social and organisational), which is in line with the global idea proposed in [8] that HEIs are agents of change for sustainability, being associated with the pressing challenges society faces related to accelerated environmental changes, the shortage of resources, increased inequality and injustice, as well as rapid technological change and social change. These results are also in line with other studies [24,25] that recognised HEIs' IC as essential in promoting SD, with examples of SD practices in environmental, economic, social and organisational dimensions being integrated into activities related to education, research, operations, social involvement and governance/culture worldwide [26].

Concerning the dimensions of IC, these are very balanced, finding a higher value in both models for SC (M1: 0.926; and M2: 0.917). The perception of SC, linked essentially to physical structures and the campus, seems to be the one both students and teachers/researchers give most importance to. This result coincides with those of other authors, e.g., [107], for whom SC is the most important part of IC because it serves as a vehicle to convert staff's personal knowledge into value. In addition, HC has the lowest value (M1: 0.879 and M2: 0.876). This difference, and also considering that the HC indicators presented the greatest problems in the models, with some of them being withdrawn, can mean that neither students nor teachers/researchers may be sufficiently well informed about their HEI's human resource system, and there may be inefficient management of these resources if it does not reveal their importance and staff's competences for the institution's good functioning.

As for the dimensions of SD, these results are in line with the state of the art, e.g., [10,22], which shows that the SD concept is associated equally with HEIs' practices of economic, environmental, social and organisational sustainability. Strangely, the social dimension, for both students and teachers/researchers, is the least robust one (M1: 0.796 and M2: 0.768), although positive and quite significant. Recovering [10], which found that Portuguese HEIs are mainly engaged in the social dimension of SD practices, contradicts the result obtained here somewhat, inasmuch as this study was made considering the perception of students and teachers/researchers. Perhaps HEIs are not sending out the right image in relation to the social dimension and/or respondents are giving greater importance to the other dimensions. This fact may be associated with the SD practices still in phases closely linked to planning, as previously advocated in [45].

Regarding hypothesis 2, according to which SD practices in HEIs have a direct and positive influence on students' QAL, this was not rejected either (M1b: 0.245). There is evidence for the presence of SD practices in HEIs that interact in students' lives, inasmuch as they are perceived by the latter and are part of their concerns. As mentioned by [46], sustainable behaviours contribute to quality of life in more instances than expected and students' perceptions of the dimensions associated with SD practices are very important for them to feel secure in both the present and future. These results strengthen the idea that SD practices are related to QAL, through the satisfaction with the experiences that create positive emotions in the context of university life experienced by students [62–68]. These satisfaction can be observed, as mentioned by [50], through several improvements in the campus environment (noise reduction, less use of paper, recycling campaigns, etc.), and in this way HEIs can contribute to greater satisfaction among students.

Concerning the result found for hypothesis 3, HEIs' SD practices have a direct and positive influence on the QWL of teachers/researchers. Despite this influence being positive and significant, for a 5% level reason the associated hypothesis is rejected. This result partially contradicts some authors, e.g., [46], who argued that SD affects QoL. Bearing in mind that QWL is a more specific construct, related to needs for satisfaction in the workplace, and not in a general way, this analogy must be done carefully because more evidence found in the HEI work context is needed.

The difference found between hypothesis 2 and hypothesis 3 sheds new light on the interesting fact that young people are more aware of, and perhaps more concerned about, matters related

to sustainability, and consequently about the future, compared to what is found in teachers' and researchers' perceptions. Therefore, the formers' perception of what is done in relation to SD in their HEI is revealed to be greater.

All in all, the results now obtained can be applied to the practice by HEIs managers through more visible sustainable efforts, building bridges within HEIs between IC, SD and QoL that will lead stakeholders to recognise the institution's sustainability efforts. For this they need, as mentioned in [23], to generate new ideas, to engage the HEIs' human resources in sustainability, promoting a better QoL, to create a baseline for continuous improvement, to inform strategic planning and budgeting, to integrate sustainability into the curriculum, to make real progress towards sustainability, and to be part of a global community involved in sustainability purposes.

## 6. Concluding Remarks and Future Research

This paper focuses on the influence of HEIs' IC (HC, SC, RC) on HEIs' SD, and on the influence of HEIs' SD on stakeholders' QoL (QAL of students and QWL of teachers/researchers), formulating three hypotheses for test purposes. To respond to the proposed objectives, after determining the state-of-the-art, a quantitative analysis was performed by collecting primary data and using a structural equation model and the PLS method. SEM–PLS supported two of the three previously formulated hypotheses.

The results obtained are important contributions to the literature on IC through the ratification of new evidences for theory, as they confirm empirically that, firstly, a positive and significant relationship exists between HEIs' IC and HEIs' SD, and secondly, a positive and significant relationship exists between HEIs' SD and students' QAL. Regarding the influence of HEIs' SD on teachers/researchers' QWL, no empirical evidence was found of a robust relationship between these two constructs, suggesting there may be other variables that are not being considered and which could possibly change this result, and so new, more thorough research in this field is suggested. Therefore, this type of relationship, never before studied, opens new theoretical horizons and new perspectives for further study and research in this area. The results indicate that IC (HC, SC and RC) has a positive and significant influence on HEIs' (economic, environmental, social and organisational) SD, since hypothesis 1 was not rejected in either model. That is, through the perception that students and teachers/researchers have of the IC and SD of their HEI, it is concluded that IC is directly and positively related to that institution's SD. These results are consistent with previous evidence [7]. HEIs should approach their IC as a whole, since all dimensions are revealed to be important. However, attention is drawn to the fact that HC is the one where there may be more room for improvement, since it had least weight in IC. Considering the results obtained in this study, for IC to produce an even greater impact on SD, HEIs should create and implement strategies towards continuous improvement of their human resources, as by devoting more attention to their human resources they can have greater empowerment and thereby influence HEIs' SD even more. This conclusion ratifies [108], which stated that human capital is an indicator of value creation that can be used to help formulate organisational strategy, provide a basis for evaluation and allocate some resources in the HEI context.

The results of this study are also in line with the previous concluding remarks found in [10], who revealed that Portuguese HEIs are beginning to give relevance to all the dimensions of SD and include them in their strategic plans, communication strategies and various policies. Nevertheless, it stands out that the social dimension has the lowest value (M1: 0.796 and M2: 0.768), and there may be room for a better positioning of HEIs through better and more proficient social engagement, as mentioned in [10], oriented towards the increasingly urgent challenges of sustainability, associated with rapid change and increased complexity and social unrest.

As for the relationship between HEIs' sustainability and QoL, there is evidence of its existence, supported by finding a positive and significant relationship between HEIs' SD and QAL. It is, therefore, underlined that HEIs have a fundamental role in promoting SD and their leaders' efforts are vital in achieving the goals associated with SD. HEIs must recognise their importance and responsibility,

not only in terms of pro-sustainability education but also by including measures of SD that have repercussions for the QoL of their stakeholders and that of the region's population and the country. As demonstrated in several studies, notably in the Spanish context, e.g., [31], it is important to develop policy statements, in order to increase sustainability practices in Portuguese HEIs [10].

HEIs should pay attention to how they manage their IC, creating value not only for the institution itself through the contribution to SD but also creating value for the QoL of their students and teachers/researchers, developing these points that may possibly be more connected to the latter's QWL. In addition, the efforts of HEI leaders should focus on achieving SD goals, and the actions promoted by these institutions should be in line with the perceptions of all their stakeholders.

Referred to as an implication, given the importance of transforming the education institution as a whole, the priority action areas undergo transformations at the level of information, because more and better information should be given about what happens in SD practices in HEIs, providing information which is accessible to all. However, and from the results obtained, perception is seen to be different depending on the stakeholder, and so SD practices should be monitored on a regular basis and the reports should be provided in such a way that everyone understands their content, using simple and accessible language. As noted by UNESCO [13], education institutions are encouraged to implement sustainability strategies and plans with institution-wide approaches, taking into account some key elements such as inter-institutional networks that facilitate mutual support, such as peer-to-peer learning on a whole-institution scale, and increase the visibility of the approach to promote it as a role model for change and adaptation.

This study also provides practical implications for stakeholders: (i) HEIs must satisfy students' needs and emotions, fostering QAL through a better engagement in sustainability activities, by integrating sustainability into the academic curriculum, and by giving more information at a higher quality about what is happening within the HEI concerning SD; and (ii) HEIs must develop some support infrastructures that allow managers to track which sustainability satisfaction needs (QWL) teachers/researchers may have, so that institutions can develop strategies leading to SD while enhancing human resources' satisfaction needs within the employer institution. For example, those needs may be related to social responsibility, and so can be addressed through the greater dissemination of the activities that the institution develops and/or intends to develop, and through specific educational training, that can contribute to both personal enrichment and a greater competence in knowledge transfer to their peers and/or students.

Regarding the limitations of this study, firstly the fact that various indicators from the initial model were eliminated, especially concerning HC, and this elimination may have limited our results. However, despite this, the final model presented very significant and conclusive results, allowing for very useful conclusions to be drawn and the non-rejection of two research hypotheses.

Secondly, the sample was confined to Portuguese HEIs and, therefore, these results cannot be generalized to HEIs in other countries.

Another aspect associated to the representativeness is the fact that the sample is related only to public university education. As Portugal has public and private HEIs and a binary system, as mentioned before, it would be worthwhile to have selected private HEIs and the polytechnic institutions. Therefore, representativeness is limited, and the results of the study cannot be generalized to the entire Portuguese higher education system. Nevertheless, based on the Portuguese public university education system, the sample was representative of the reality under study, since each institution was located in a different region at the NUTS II level.

Thirdly, HEI stakeholders were represented by only students and teachers/researchers. However, in studies made in other HEIs, the top management and/or leadership are almost always the ones surveyed.

As mentioned, the difference in the results found for QAL and QWL is a serious, sustained warning based on new empirical evidence, that young people are more aware of issues related to sustainability than teachers and researchers, since the former denote an high level of perception concerning sustainability issues, due to previous engagement in education programmes, which raised

their social consciousness on the need for change and addressing sustainability issues associated with climate change, social inequality and common well-being, which they tend to value as change mechanisms that can contribute to improving their quality of life, including the academic context and society as a whole. Here, the age factor may have some relevance, in that young people have been found to show greater concern about sustainability and the future of the planet. Nevertheless, the role attributable to pro-sustainability education from an early age can no longer be ignored, including the economic, social, environmental and organisational dimensions, as this can make all the difference in the inter-related cycles of learning and performance throughout life.

With this final motivation, a window of opportunity opens to make future comparative studies based on the age factor and pro-sustainability education factor, since we believe that both can be determinant for the development of successful SD practices, in the HEI context in particular, and society in general. Future research avenues can be explored by developing studies focusing especially on HC, aiming to test disaggregated measures and indicators of this critical asset. Adding to this, cross-country comparisons are suggested in light of the whole-institution approach, in order to assess the role played by "organisational inertia", in terms of potential resistance to change involving the adoption of a whole-institution sustainability vision and the implementation of SD practices at the institutional level. It would be also of interest to deepen the scarce knowledge on IC in HEIs by contrasting the perceptions of the governance board and the students concerning the different activities of this type of knowledge institution, which play a significant role in educating proactive citizens regarding sustainable development and quality of life, with a clear vision of social impact.

**Supplementary Materials:** The following are available online at http://www.mdpi.com/2071-1050/12/2/479/s1, Table S1. List of constructs and respective indicators referring to models 1 and 2.

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